



## RESPONSE OF GARDEN EGG (*Solanum melongena*) TO TWO METHOD OF N.P.K APPLICATION

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### ABSTRACT

The experiment was carried out at the Horticultural garden, Federal College of Forestry, Ibadan to study response of garden egg to two methods of NPK application during the rainy season of 2022. The treatment consist of two application methods (foliar and side placement) of fertilizer. Foliar method of application consists of four treatments (which were T<sub>1</sub> (1ml/l), T<sub>2</sub> (2ml/l), T<sub>3</sub> (3ml/l) and T<sub>4</sub> (4ml/l), while the side placement application also consist of four treatments (which were T<sub>5</sub> (100kg/ha), T<sub>6</sub> (120kg/ha), T<sub>7</sub> (140kg/ha) and T<sub>8</sub> (160kg/ha) and a control. These were replicated 4 times and laid out in a randomized complete block design (RCBD). Parameters assessed were plant height, stem diameter, number of leaves, number of fruits, number of days to first flower and weight at harvest. The growth parameters were assessed weekly for 9 weeks while the experiment was terminated at harvest (11 weeks). Data collected were subjected to Analysis of Variance (ANOVA). The result of study showed that 140 kg NPK/ha had the highest mean plant height of 49.97cm while control recorded the lowest value of 18.77cm. In terms of stem diameter and number of leaves 160 kg/ha had the highest values. There were significant differences observed among the treatments in the growth parameters. 4 ml/L recorded the lowest number of days first to flower while 160 kg/ha had the heaviest fruits (1279.0g) at harvest. It can therefore be recommended that T<sub>8</sub> (160kg/ha) side placement method and a little above T<sub>4</sub> around 5ml/l foliar method of fertilizer application should be used for the production of Garden egg in the study area.

**Keywords:** Garden egg, Horticulture, Fertilizer, Foliar

### INTRODUCTION

Eggplant (*Solanum melongena*) is one of the major vegetables grown in West Africa, the crop is known by several names like aubergine and egg plant in Europe and United States, "bringers" in South East Asia and it is only known as garden eggs in West Africa (Obeng-Ofori *et al.*, 2007). The crop is grown for either the immature fruits or leaves depending on the locality. The immature fruits are either eaten raw or cooked (Grubben and Denton, 2004). The crop is cultivated in tropical Africa, Asia and America and throughout the tropical and subtropical areas (Tindall, 1992). Eggplant fruits are known for being low in calories and having a mineral composition beneficial for human health. They are also a rich source of potassium, magnesium, calcium and iron 3. Eggplant fruits are known for being low in calories and having a mineral composition beneficial for human health. They are also a rich source of potassium, magnesium, calcium and iron 3 and 5. The fruit can be eaten raw or served as a



baked, grilled, fried or boiled vegetable and can be used in stews. The area devoted to the cultivation of the crop globally is about two million hectares (FAO, 2007). With the growing consumption of garden eggs, there is a need to ensure high quality fruits with minimal or no sacrifice of quality and at the same time leaving the soil un-degraded chemically, physically and biologically. Foliar fertilization is gaining more importance in recent years due to availability of soluble fertilizers and is of great significance in rain fed areas and under changing climatic conditions. Many research reports indicated positive effect in enhancing crop yield and quality of oilseed/pulse crops. Foliar application of nutrients constitutes one of the important milestones in the progress of agricultural production. Fertilizer applied to the crop at the time of sowing is not fully available to the plants as the crop approaches maturity so supplemental foliar application is one of the techniques to increase yield of the crop.

It has been established in various research studies that plant leaves and other above-ground parts are capable of absorbing chemicals and nutrients. Absorption of nutrients by plants is not a function limited to the root system. Foliar nutrition is ideally designed to provide many elements to a crop that may be limiting production at a time when nutrient uptake from the soil is inefficient or nonexistent (Hiller, 1995). Several researches are being done on supplying fertilizer through the leaves and on viable fertilization alternatives on a number of nutrients like phosphorus (Ekelof, 2007), and silicon (Buck *et al.*, 2008) using lower amounts that would provide the needed nutrient or else stimulate its beneficial effects. Elwan (2010) mentioned that spraying of di-potassium hydrogen orthophosphate ( $K_2HPO_4$ ) ameliorated the negative effects of salinity on plant growth, fruit yield and fruit total sugar content of eggplant. Thus, the advantages of this technique should be explored, such as the smaller fertilizer use (since foliar fertilization consists on supplying small amounts of nutrients directed to the leaves), lower cost, ease of application, good quality of fertilizers used and fertilizers readily soluble in water (Buck *et al.*, 2008). The effect of phosphorus on root development is well established (Hossain and Hamid, 2007). Application of phosphorus and nitrogen fertilizer enhances root development, which improves the supply of other nutrients and water to the growing parts of the plants, resulting in an increased photosynthetic area and thereby more dry matter accumulation (Ali *et al.*, 2010). With the growing consumption of garden eggs, there is a need to ensure high quality fruits with minimal or no sacrifice of quality and at the same time leaving the soil un-degraded chemically, physically and biologically. That was why Foliar application and side placement of N.P.K 15:15:15 fertilizer were applied at different rates to garden egg plants and the comparative effects were taken into consideration to help us know the which treatment is best suited for production of garden egg for maximum yield and soil conservation.

## **MATERIALS AND METHOD**

### **Experimental Site**

The experiment was carried out within the premises of Federal College of Forestry Jericho Ibadan, Nigeria. The experimental site lies on latitude  $7^{\circ}54'N$  and longitude  $3^{\circ}34' E$  above sea level. The average annual rainfall ranges from 1400mm-1500mm. The average temperature is about  $32^{\circ}C$  with the average between humidity of 80-85% with two district season of wet (April - October) and (November - March). (FRIN, 2018). The materials used for the experiment were: Top soil, Garden egg seeds, Hoe, Weighing balance, Sieve, Watering can, Veneer caliper, Measuring Ruler, Hand glove, Hand trowel, Paper tape, measuring tape, Recording book and pen, Cutlass. The seeds of Garden egg were obtained from the National Institute of Horticultural Research and Training (NIHORT) and N.P.K 15:15:15 granular and liquid forms were obtained from a fertilizer store at Ogunpa market, top soil used to raise the



seeds in a germination bowl was gotten from the College. The treatment consist of two application methods (foliar and side placement) of fertilizer. Foliar method of application consists of four treatments (which were T<sub>1</sub> (1ml/l), T<sub>2</sub> (2ml/l), T<sub>3</sub> (3ml/l) and T<sub>4</sub> (4ml/l), while the side placement application also consist of four treatments (which were T<sub>5</sub> (100kg/ha), T<sub>6</sub> (120kg/ha), T<sub>7</sub> (140kg/ha) and T<sub>8</sub> (160kg/ha) and a control. These were replicated 4 times and laid out in a randomized complete block design (RCBD). The seedlings were raised in a germination bowl for four weeks using top soil. 5 plots measuring 2m x 2m each were prepared for eventual transplanting of the seedlings at a spacing of 0.75m x 0.25m (75cm x 25cm). Data were collected at weekly interval on:

Plant Height, Number of Leaves and Stem diameter. Others are number of Days to first flower and Number of Fruits and Weight at Harvest. All data collected were subjected to Analysis of Variance (ANOVA) and means were separated using Duncan Multiple Range Test (DMRT).

## RESULTS AND DISCUSSION

### Physic-chemical Properties of Soil of The Experimental Site

Table 1 describes the chemical and structural analysis of the soil used for the experiment. The nutrient requirements for planting garden egg are 27 kg/ha of N, 46 kg/ha of P<sub>2</sub>O<sub>5</sub> and 34 kg/ha of K<sub>2</sub>O (Horticulture Development Unit (HDU-DCS), MOFA 2011), the nutrient composition of the soil was below the nutrient requirement of the plant. This necessitated the addition of NPK 15:15:15 via foliar application and soil application to enhance the crop performance.

**Table 1:** Chemical and particle size analysis of the soil

Parameters	Values
pH	5.75
O.C%	0.28
O.M%	0.31
T.N%	0.016
Available P (mg/kg)	6.48
Na	0.54
K	0.19
Ca	0.85
Mg	7.81
<b>Micronutrient (mg/kg)</b>	
Mn	57
Fe	74
Cu	1.8
Zn	170
<b>Particle size (%)</b>	
Sand	83.0
Clay	8.6
Silt	8.4

Table 2 showed the result of effects of foliar application and side placement of NPK on plant height of eggplant. The result revealed a significant ( $P \leq 0.05$ ) difference among the treatments used. The result further showed that, treatment 7 consistently produced significantly



( $P \leq 0.05$ ) tallest plants than the other treatments used throughout the study period. Control plot on the other hand, produced the shortest plants. The significant difference observed in this study indicated the importance of granular NPK fertilizer application in garden egg production. The result of this findings is in agreement with the finding of Ugwuegbulam, O.C. (2020), It is also in support of the report of Omotosho (2007), that confirmed by that NPK fertilizer significantly increased growth parameters (plant height, and number of leaves), yield and yield components if optimum yield of okra will be obtained.

**Table 2:** Effect of Foliar Application and Side Placement of N.P.K on Plant Height of Eggplant

App Rate	WEEKS				
	1	3	5	7	9
T1	11.75bc	15.75abc	21.13bc	23.65°	24.25d
T2	8.50cd	10.70cd	14.33d	22.55°	25.55d
T3	11.28bc	13.55abc	19.10°	27.70b	30.98 <sup>c</sup>
T4	11.53bc	15.98ab	22.08bc	28.38ab	32.50bc
T5	10.78	13.10	20.80	30.50	34.03
T6	13.28ab	15.50abc	25.18ab	28.38ab	44.13a
T7	16.35 <sup>a</sup>	18.18 <sup>a</sup>	27.90 <sup>a</sup>	30.70 <sup>a</sup>	45.95 <sup>a</sup>
T8	11.03bc	13.15abc	22.28bc	29.20ab	43.83a
T0	6.20 <sup>e</sup>	7.20 <sup>e</sup>	11.58 <sup>f</sup>	14.75 <sup>f</sup>	18.77 <sup>e</sup>
LS	*	*	*	*	*
SE±	0.94	1.08	1.68	1.71	3.22

LS =Level of significance, SE = Standard error, \* = significant @ 0.05 probability level, means followed by the same letter within a column are statistically same by DMRT

### Number of Leaves

Table 3 showed the result of effects of foliar application and side placement of NPK on number of leaves of eggplant. The result revealed a significant ( $P \leq 0.05$ ) difference among the treatments used. The result further showed that, treatment 4 consistently produced significantly ( $P \leq 0.05$ ) high number of leaves than the other treatments used throughout the study period. Control plot on the other hand, produced the lowest number of leaves. The significant difference observed in this study indicated the importance of foliar application of NPK fertilizer in garden egg production.

**Table 3:** Effect of Foliar Application and Side Placement of N.P.K on number of leaves of Eggplant

App Rate	WEEKS				
	1	3	5	7	9
T1	5.25 <sup>b</sup>	7.25 <sup>a</sup>	11.50 <sup>c</sup>	15.75 <sup>e</sup>	19.25 <sup>c</sup>
T2	2.75 <sup>de</sup>	3.00 <sup>d</sup>	8.50 <sup>d</sup>	20.00 <sup>d</sup>	21.25 <sup>o</sup>
T3	7.25	6.50	15.25	23.25	29.50
T4	4.00 <sup>bcde</sup>	7.25 <sup>a</sup>	19.25 <sup>a</sup>	28.25 <sup>a</sup>	38.75 <sup>a</sup>
T5	4.50 <sup>bcd</sup>	6.25 <sup>ab</sup>	14.00 <sup>bc</sup>	20.00 <sup>d</sup>	22.25 <sup>o</sup>
T6	3.25 <sup>cde</sup>	3.25 <sup>cd</sup>	12.00 <sup>c</sup>	22.25 <sup>cd</sup>	34.75 <sup>a</sup>
T7	2.25 <sup>e</sup>	4.75 <sup>abcd</sup>	13.25 <sup>bc</sup>	22.25 <sup>cd</sup>	34.75 <sup>a</sup>
T8	4.00 <sup>bcde</sup>	3.75 <sup>bcd</sup>	13.50 <sup>b</sup>	25.75 <sup>ab</sup>	38.00 <sup>a</sup>
TO	4.75 <sup>bc</sup>	5.75 <sup>abc</sup>	7.75 <sup>d</sup>	12.00 <sup>f</sup>	14.75 <sup>d</sup>
LS	*	*	*	*	*
SE±	0.45	0.56	1.16	1.64	2.98

LS =Level of significance, SE = Standard error, \* = significant @ 0.05 probability level, means followed by the same letter within a column are statistically same by DMRT

### Stem Diameter

Table 4 showed the result of effects of foliar application and side placement of NPK on stem girth of the eggplant. The result revealed a significant ( $P \leq 0.05$ ) difference among the treatments used. The result further showed that, treatment 8 produced significantly ( $P \leq 0.05$ ) high diameter of stem girth than the other treatments used during the study period in week 9. Control plot on the other hand, produced the lowest number of leaves. The significant difference observed in this study indicated the importance of granular NPK fertilizer application in garden egg production. The result of this findings is in agreement with the finding of Aderemi, F.T. (2020) that supported this result and stated that NPK 15.15.15 granules performed better in collar diameter pepper.

**Table 4:** Effect of Foliar Application and Side Placement of N.P.K on Stem Diameter of Eggplant

Type App rate	WEEKS				
	1	3	5	7	9
T1	0.57 <sup>a</sup>	1.79 <sup>bc</sup>	3.21 <sup>e</sup>	5.16 <sup>e</sup>	7.25 <sup>e</sup>
T2	0.66 <sup>a</sup>	1.92 <sup>ab</sup>	3.70 <sup>d</sup>	5.61 <sup>d</sup>	8.63 <sup>d</sup>
T3	0.66 <sup>a</sup>	1.97 <sup>a</sup>	3.97 <sup>c</sup>	6.55 <sup>c</sup>	10.40 <sup>c</sup>
T4	0.65	1.70 <sup>o</sup>	3.81 <sup>cd</sup>	7.01 <sup>b</sup>	11.28 <sup>b</sup>
T5	0.61	1.84	3.24	5.47	7.49
T6	0.56 <sup>a</sup>	1.69 <sup>c</sup>	4.77 <sup>a</sup>	7.17 <sup>ab</sup>	12.17 <sup>a</sup>
T7	0.62	1.74	4.74	7.28	12.14
T8	0.61 <sup>a</sup>	1.79 <sup>bc</sup>	4.40 <sup>b</sup>	7.15 <sup>ab</sup>	12.38 <sup>a</sup>
TO	0.52	1.17	2.47	4.08	5.74
LS	*	*	*	*	*
SE±	0.03	0.21	0.67	0.93	1.91

LS =Level of significance, SE = Standard error, \* = significant @ 0.05 probability level, means followed by the same letter within a column are statistically same by DMRT



**Effect of Foliar Application and Side Placement of N.P.K 15:15:15 on Flowering and Fruiting of Eggplant**  
**Number of Fruits**

Table 5 shows the number of fruits harvested. Treatment 8 was shown to produce the most number of fruits, while the control has the least number of fruits produced. However, treatment 3, 6 and 7 produced a good number of fruits with at least 50 fruits. Treatments 1, 2 and 5 did not perform well with treatments producing less than 20 fruits. The result of this findings is in line with the earlier findings MacDonald and John (1984) and later supported by Idio and Adinya (2017) that reported that yield of eggplant performance was better in plots that were applied NPK 15.15.15 granules fertilizer than in control plot.

**Table 5:** Effect of Foliar Application and Side Placement of N.P.K on Number of Fruits of Eggplant

Treatment	No of Fruits
T1	16 <sup>c</sup>
T2	17 <sup>c</sup>
T3	50 <sup>b</sup>
T4	58 <sup>a</sup>
T5	13 <sup>c</sup>
T6	54 <sup>ab</sup>
T7	55 <sup>ab</sup>
T8	59 <sup>a</sup>
T0	7.0 <sup>d</sup>
LS	*
SE±	2.06

LS =Level of significance, SE = Standard error, \* = significant @ 0.05 probability level, means followed by the same letter within a column are statistically same by DMRT

**Fruit Weight**

From the results obtained above treatment 8, has the highest number of weight with 1279g though it is not significantly different from treatment 4 and 7 with over 1252g and 1208g respectively, treatment 1 2 and 5 had weight lower than 200g which shows that their performance is low, the control had the least weight of 60g which shows a poor performance.

**Table 6:** Comparative Effect of Foliar Application and Side Placement of N.P.K on fruit weight at harvest of Eggplant

TREATMENT	FRUIT WEIGHT (g)
T1	150 <sup>d</sup>
T2	174 <sup>d</sup>
T3	1050 <sup>d</sup>
T4	1252 <sup>ab</sup>
T5	132 <sup>b</sup>
T6	1122 <sup>c</sup>
T7	1208 <sup>b</sup>
T8	1279 <sup>a</sup>
T0	60.0 <sup>e</sup>
LS	*
SE±	22.67

LS =Level of significance, SE = Standard error, \* = significant @ 0.05 probability level, means followed by the same letter within a column are statistically same by DMRT





## CONCLUSION AND RECOMMENDATION

From the results obtained so far it was observed that all the treatments has significant effect on plant height when compared to the control but Treatment 7(140kg/ha) which is side placement or side dressing application at 3 had the highest plant height at 9 weeks after planting although it was not significantly different from treatment 8 and 6 side placement 4 and 2 respectively. These treatments also had significant differences on the number of leaves produced when compared to the control, but treatment 4(4mil/L) and 8(160kg/ha) produced the highest number of leaves and are not significantly different from each other 38.00 leaves at 9 weeks after planting. Also in comparison to the control the treatments had significant effect on the stem girth or diameter of eggplant but at 9 weeks after planting treatment 8(160kg/ha) had the highest stem girth of 12.38 although not significantly different from treatment 7(140kg/ha) and 6(120kg/ha) at 9 weeks after planting. Treatment 4(4mil/L) was observed to first flower. From the above results gathered it is recommended that for optimum production of *Solanum melongena* L side placement application 160kg/ha of N.P.K 15:15:15 should be applied and for foliar application of N.P.K 15:15:15 5mil/l should be applied.

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